

CLAIMS

1. An IPM electric rotating machine comprising:
a stator; and

a rotor including a rotor core and a plurality
5 of permanent magnets functioning as a field magnet
system,

wherein said rotor has a side face opposed to
said stator,

wherein said permanent magnets each have a pole
10 face opposed to said side face,

wherein said permanent magnets are embedded so
that a maximum value of a distance from said pole face
to said side face satisfies the following formulas
(1a) and (1b) which are represented by a radius r of
15 said rotor, and a number of poles of said field magnet
system:

$$x \leq D/10, \text{ and} \quad \dots (1a)$$

$$D = 2\pi r/n_1, \text{ and} \quad \dots (1b)$$

wherein adjacent two of said permanent magnets,
20 which function as adjacent two poles of said field
magnet system, are spaced apart so that the following
formula (2) is satisfied, which is described using
a q-axis inductance L_q , and d-axis inductance L_d :

$$0.3 < (L_q - L_d)/L_d \quad \dots (2).$$

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2. The IPM electric rotating machine according to
claim 1, wherein said stator is fed with a three-
phase current, and

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wherein said number of poles n_1 of said field magnet system and a number of slots n_2 provided for said stator are any one of the following combinations:

- $n_1 = 12, n_2 = 9,$
- 5 $n_1 = 14, n_2 = 12,$
- $n_1 = 16, n_2 = 12,$
- $n_1 = 16, n_2 = 18,$
- $n_1 = 20, n_2 = 15,$
- $n_1 = 20, n_2 = 18,$
- 10 $n_1 = 20, n_2 = 21,$
- $n_1 = 22, n_2 = 24,$
- $n_1 = 24, n_2 = 18,$
- $n_1 = 24, n_2 = 27,$
- $n_1 = 26, n_2 = 24,$
- 15 $n_1 = 28, n_2 = 24, \text{ and}$
- $n_1 = 30, n_2 = 27.$

3. The IPM electric rotating machine according to claim 1, wherein said stator is fed with a five-phase
20 current, and

wherein said number of poles n_1 of said field magnet system and a number of slots n_2 provided for said stator are any one of the following combinations:

- $n_1 = 12, n_2 = 10,$
- 25 $n_1 = 14, n_2 = 10,$
- $n_1 = 22, n_2 = 20,$
- $n_1 = 18, n_2 = 20,$
- $n_1 = 24, n_2 = 20,$

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$$n_1 = 26, n_2 = 20,$$

$$n_1 = 28, n_2 = 20,$$

$$n_1 = 26, n_2 = 30, \text{ and}$$

$$n_1 = 28, n_2 = 30.$$